E2KW 2013 Energy and Environment Knowledge Week
Toledo, Spain
20th-22nd – November
cytema Energy and Environment Science and Technology Campus
CAMPUS OF INTERNATIONAL EXCELLENCE

# MAPPING ENERGY EFFICIENCY BARRIERS

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# OUTLINE

- PURPOSE
- APPROACH
- FINDINGS
- CONCLUSIONS & LIMITATIONS

# GENERAL RESEARCH QUESTION:

## WHICH ARE THE SUBOPTIMAL ENERGY EFFICIENCY INVESTMENT REASONS?

- The **purpose** of this work is to address the energy efficiency problem following the **system perspective** taking into account the interactions among different elements:
  - BARRIERS
  - STAKEHOLDERS
  - POLICIES

# PURPOSE



- INDUSTRIAL ENERGY POLICY RESEARCH
  - ENERGY EFFICIENCY GAP:
  - IDENTIFY BARRIERS which inhibit the adoption of cleaner equipments and manufacturing experiences, as learning from the experiences of other countries
- 1998 Efficiency Paradox DeCanio
  - Empirical anomaly in the economics of energy efficiency
    - Highly profitable energy-saving opportunities exist
    - It is needed a more comprehensive theories of the investment behaviour of firms
    - Empirical evidence of barriers to the adoption of energy-efficient technologies has been widely reported in the literature.

# APPROACH



- Multi-disciplinary nature of energy efficiency
  - There is no consensus on which barriers are the **most important**.
  - The classification of this barriers are well known
- It is needed a **system thinking** to understand the interaction among barriers.

# EARLIER STUDIES



- In the early years, barriers to energy efficiency were explained using theories from the economics attributed to MARKET FAILURES
  - Imperfect market
  - Information problems, unpriced energy costs
  - Spillover nature of research and development

- However , market failures can only account for part of the energy efficiency gap.

# RECENT YEARS

## ENERGY EFFICIENCY BARRIERS STUDIES

- It is a multifaceted topic entailing
  - technical, economic and organizational challenges.
- Recent years:
  - More inclusive and open approach by conducting interviews and surveys and performing case studies to identify barriers in the industrial sector.
  - Barriers were identified according to their nature.
  - Lack of confidence in governmental sponsored energy audit. ***High trust in information & energy strategies sponsered by associations and colleagues***.

# Energy Efficiency Barriers



| THEORY | BARRIER |
|---|---|
| ECONOMIC | HIDDEN COST<br>ACCES TO CAPITAL<br>RISK HETEROGENEITY<br>IMPERFECT INFORMATION<br>PRINCIPAL-AGENT RELATIONSHIP<br>ADVERSE SELECTION<br>SPLIT INCENTIVES |
| BEHAVIORAL | BOUNDED RATIONALITY<br>INERTIA<br>CREDIBILITY & TRUST<br>FORM & SOURCE OF INFORMATION<br>VALUES |
| ORGANIZATIONAL | CULTURE<br>POWER<br>EMPLOYEES TRAINING |

# METHODOLOGY



- 2 STEPS

  1- PILOT CASE STUDIES, INTERVIEWS TO ESCOS & CLIENT COMPANIES

  OBJECTIVE: TESTING A QUESTIONAIRE AND PREVIOUS RESULTS THAT WE PRESENT HERE

  2- QUESTIONAIRE

  Asociación Nacional Empresas Servicios Energéticos: ESES – ESCOS

# DATA SOURCE:

http://www.anese.es/

anese
Asociación de Empresas de Servicios Energéticos

ANESE, Asociación Nacional de Empresas de Servicios Energéticos, es una plataforma empresarial sin ánimo de lucro que surge con el objetivo de estructurar el **mercado de los Servicios Energéticos,** un sector **en fase incipiente** pero con una importante proyección, en el que las empresas españolas, independientemente de su tamaño, tienen una gran oportunidad de negocio.

Nace en noviembre de 2009 por iniciativa de cuatro empresas: 3i Energía, Arabasalo, Enervalia (actualmente AMERESCO) y Exeleria, y comienza su actividad en enero de 2010.

Actualmente, es la asociación más representativa del sector con más de **130 empresas asociadas**; compañías involucradas en el ámbito de la gestión eficiente de la energía, especialistas en distintas aéreas de actuación :

**consultoría,** auditoría,
**ingeniería, instalación, mantenimiento,**
fabricantes y servicios financieros.

Muestra: 50 empresas INSTALADORAS

En España hay más de 600 empresas que se denominan ESEs

anese
Asociación de Empresas de Servicios Energéticos

ANESE - Asociación Nacional de Empresas de Servicios Energéticos

**Spanish Association of Energy Services Companies**.

- Nonprofit business platform, founded in November 2009.
- Currently it comprises almost 130 companies which, regardless of the various activities developed in the energy sector, are configured as Energy Service Companies, as it is defined in the Directive 2006/32/EC about the final-use energy efficiency and the energy services.

Statistical sample for the questionaire:

50 Install & Engineering Co.

# ANESE, PARTNERS

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SOCIOS PROTECTORES ORO

SOCIOS PROTECTORES BRONCE

SOCIOS DE NÚMERO

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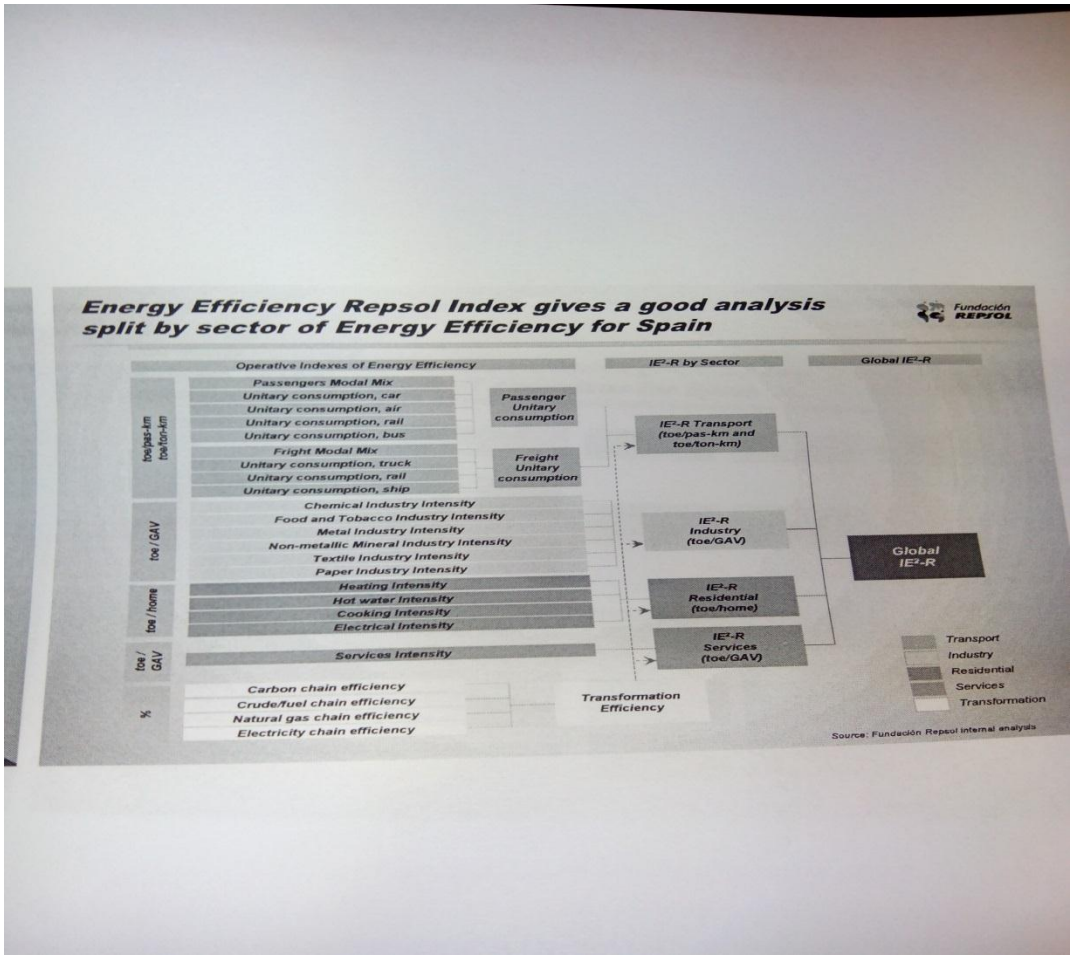
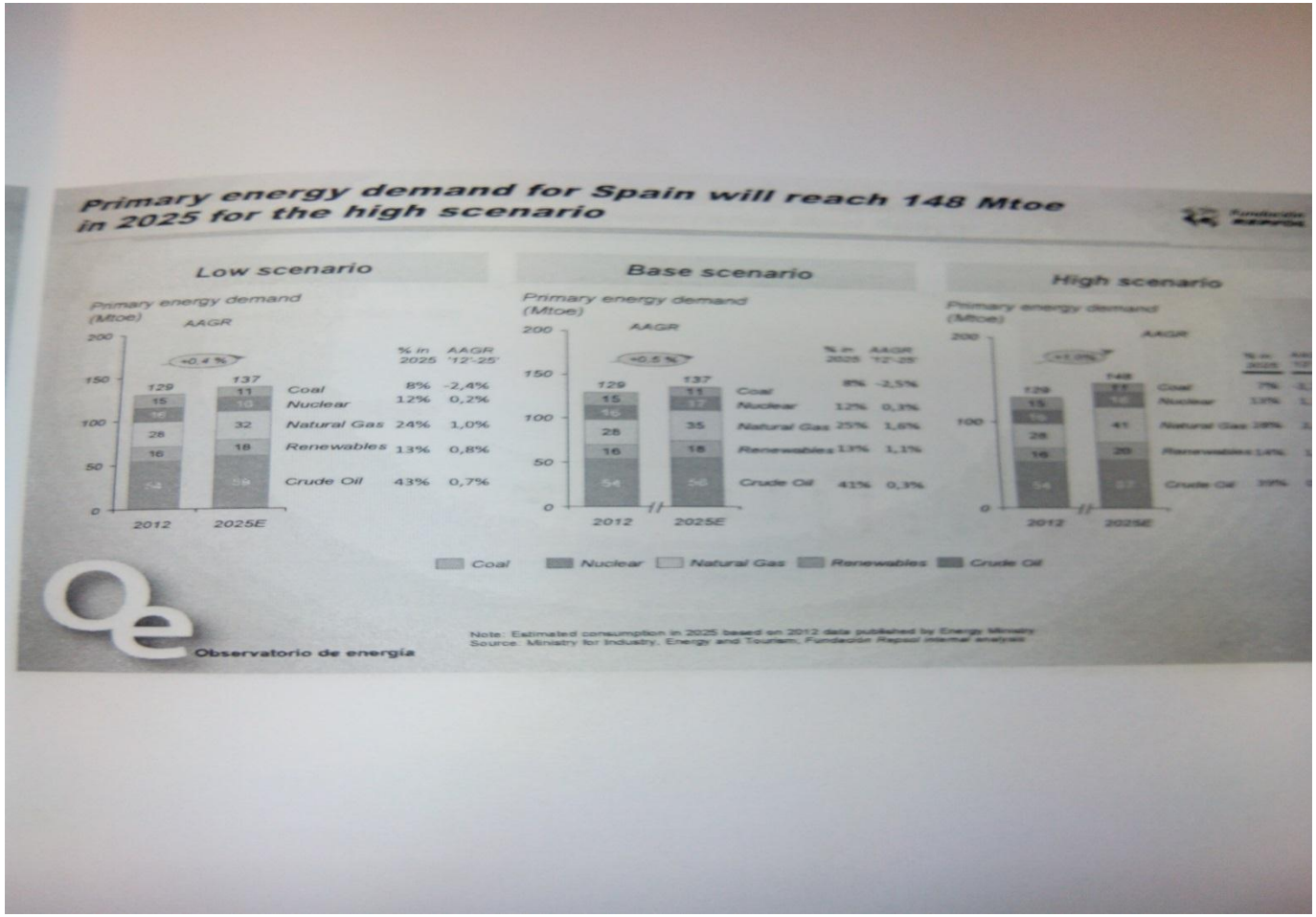
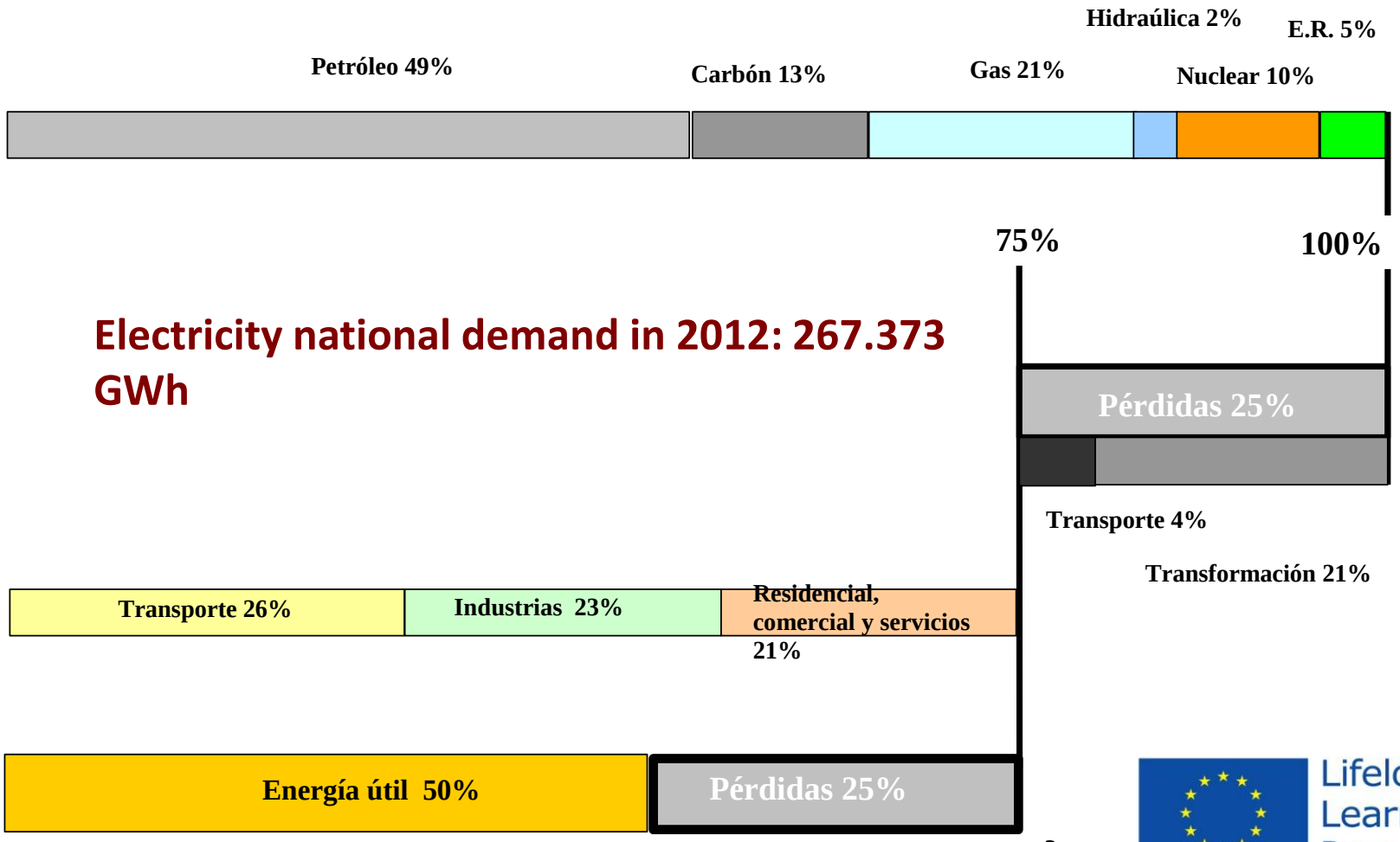
Fundación Repsol Internal Analysis




Primary energy demand for Spain will reach 148 Mtoe in 2025 for the high scenario
Low scenario
Base scenario
High scenario
Primary energy demand (Mtoe)
AAGR
+0.4 %
+0.5 %
+1.0%
% in 2025
AAGR '12'-25'
Coal 8% -2,4%
Nuclear 12% 0,2%
Natural Gas 24% 1,0%
Renewables 13% 0,8%
Crude Oil 43% 0,7%
Coal 8% -2,5%
Nuclear 12% 0,3%
Natural Gas 25% 1,6%
Renewables 13% 1,1%
Crude Oil 41% 0,3%
2012
2025E
Coal
Nuclear
Natural Gas
Renewables
Crude Oil
Observatorio de energía
Note: Estimated consumption in 2025 based on 2012 data published by Energy Ministry
Source: Ministry for Industry, Energy and Tourism; Fundación Repsol internal analysis

# ENERGY EFFICIENCY IN SPAIN.
# General Overview

## Energy efficiency: the other "fuel" of the energy mix






Lifelong Learning Programme

# FINDINGS



- IN THIS CONFERENCE,

WE PRESENT THE RESEARCH WE ARE FOLLOWING IN COLLABORATION WITH ANESE

http://www.anese.es/casos-de-exito/

to check the interaction among barriers that previous studies have identified.

- We focus our research question in the **INFORMATION PROBLEMS** that include a number of specific problems such as
  - lack of information,
  - asymmetric information and
  - the well-documented principle-agent problem.

- Asymmetric information problems occur when one party involved in a transaction has more information that the other, which leead to suboptimal energy decisions.

- The fact that energy efficiency cannot be observed (**it can be measured**) further intensifies this asymmetric information barrier.

- INTERACTION- RELATIONSHIP
  - STAKEHOLDERS
    - ESCOS-CLIENTS
  - BARRIERS: Information, trust, RELATIONSHIP, source of information, employees training
  - POLICIES: Directive 2006/32/EC, Directive 2012/27/UE

# FINDINGS

- The Client & ESCOS arrange
  - Different Energy Performance Contracts
    - To assume the investment and risk
    - Share the savings
- The ESCO company guarantees energy savings

# FINDINGS



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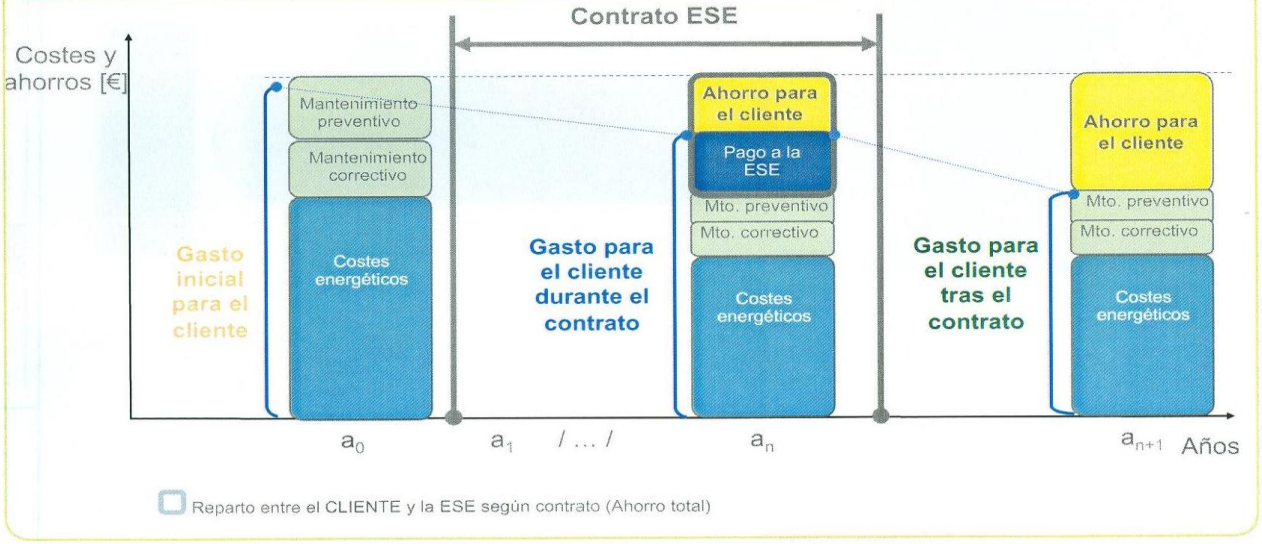
## ESEs – Pago del servicio con los ahorros

Según el contrato acordado entre la ESE y el Cliente, éste puede empezar a recuperar parte del ahorro desde el inicio de contrato, alcanzando la totalidad del ahorro con la finalización del mismo.

**Evolución de los gastos para el cliente y ahorros energéticos alcanzados**





# RESULTS
# PILOT CASE STUDY

- Ensure client performance- Customer DRIVEN organizations
- Information ABOUT

  1- Technology and the relationship with the Client Business Plan

  2- Control Measure

  3- CONTRACTS: INFORMATION on measurement and verification of savings

  4- Establishing measurement protocols (closing the contract is a very complicated phase): ENERGY PERFORMANCE CONTRACTING

  5- Access to finance is complicated

- Employee Training: technical skills and commercial approach.
  - Management training : technical, business plan and contract management
- CREDIBILITY & TRUST THE INFORMATION: It should be vivid, personal, simple and specific.

Thank you for your attention!

Questions??

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